

# Marine Debris: The Urban-Coastal Connection

## Lesson Plan

This environmental science unit will teach students how trash and litter travel through urban watersheds and impact coastal environments.



Grades 4-7

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## Pre-Unit Activity

### Litter Survey



**Grades:** 4-7



**Time:** 10 minutes to take Litter Survey; 10 minutes to discuss the Litter Survey after Classroom Activity 1.



**Objective:** Students will discover their own attitudes and habits regarding litter.



**Activity:** Print out and distribute the Litter Survey prior to teaching the first Classroom Activity: Litter and Debris in Our Urban Waterways. Ask students to answer each question honestly and let them know that their answers will be submitted anonymously, so that they will not feel pressure to answer in a certain way.

After teaching Classroom Activity 1 to the students, try to discuss and determine if their attitude about littering has changed and if they will make more of an effort not to litter now that they have learned about marine debris.

## Pre-Unit Activity

### Litter Survey

1. - **Have you ever seen trash or litter outside on the ground? (Yes/No)**
  
2. - **Have you ever littered? (Yes/No)**
  
3. - **If yes, why? (Circle all that apply)**
  - a. It was convenient.
  - b. I didn't think it was bad.
  - c. It was an accident.
  - d. Other
  
4. - **Who do you think picks up trash/litter on the street or in your - neighborhood? (Circle all that apply) -**
  - a. Workers employed by my city or town.
  - b. Street sweeping machines.
  - c. No one picks it up.
  - d. Other
  
5. - **Have you ever made a special effort not to litter? (Yes/No)**
  
6. - **If yes, why? (Circle all that apply)**
  - a. Litter is ugly.
  - b. It is illegal.
  - c. Litter hurts animals and people.
  - d. Other
  
7. - **If you saw someone else litter, what would you do? (Circle all that apply)**
  - a. Pick up the litter yourself.
  - b. Tell someone (such as a police officer or teacher).
  - c. I wouldn't do anything.
  - d. Other
  
8. - **What do you think happens to the trash/litter on the street or in your neighborhood? (Circle all that apply)**
  - a. It breaks down in a few days.
  - b. It ends up as marine debris in waterways and on beaches.
  - c. It kills marine wildlife.
  - d. Other

## Classroom Activity 1

### Lesson and Quiz: Litter and Debris in Our Urban Waterways



**Grades:** 4-7



**Time:** 30 – 45 minutes total; 15 – 30 minutes for lesson.



**Objective:** Students will learn about litter and marine debris, its sources and impacts, and what they can do to help.



**Materials:**

- Lesson
- Quiz and Answers



**Procedure:** Use the lesson provided to develop a classroom lecture or student handout. Students can read the handout on their own or teachers can ask the students to take turns reading each section aloud.

After the lecture or reading, hold a brief class discussion of what students have learned. Refer back to the pre-unit activity litter survey and ask if the students' attitudes have changed.

Follow up with the Quiz.

## Classroom Activity 1

### Lesson: Litter and Debris in Our Urban Waterways

#### What is Marine Debris?

Marine debris is trash that enters our streams, rivers, and oceans. Littering is a major cause of marine debris.

The most common types of marine debris are disposable items that we use every day. In September 2010, nearly 600,000 volunteers participating in the annual International Coastal Cleanup picked up more than 8 million pounds of trash from shorelines and inland areas around the world. The top ten items found during the annual cleanup were:

1. Cigarettes and cigarette filters
2. Plastic beverage bottles
3. Plastic bags
4. Caps and lids
5. Food wrappers and containers
6. Cups, plates, forks, knives, spoons
7. Glass beverage bottles
8. Straws/stirrers
9. Beverage cans
10. Paper bags

#### The Urban-Coastal Connection

The waters around us are connected. We all live in a watershed - the area that drains to a common waterway, such as a stream, lake, wetland, and even the ocean. Your local streams and wetlands empty into rivers, and rivers empty into the ocean. For trash, a watershed acts like a vehicle; trash can travel hundreds or even thousands of miles through the watershed. A piece of litter dropped on a city street can be blown by wind or washed by rain into a nearby waterway, and begin its journey to the ocean.

#### Sources of Marine Debris

Land-based sources: Most marine debris starts out on land. Small towns, big cities, rural areas, and urban areas, are all considered land-based sources of marine debris. Urban areas, however, tend to produce more trash and litter because they are more densely populated (i.e., a lot of people in one place). Once the trash enters the urban watershed it may eventually be transported to the sea and become marine debris.

Trash gets into urban waterways in a number of different ways:

- One of the biggest problems is littering. People leave trash in parking lots, on streets, and on beaches. They even toss trash out of their car windows.
- Another problem is mishandled or mismanaged trash, because it can also find its way to waterways. Garbage and recycling bins that are not properly covered or are overflowing can spill trash into the street. Trash can also fall off garbage trucks.

## Classroom Activity 1

### Lesson: Litter and Debris in Our Urban Waterways

Additionally, industrial facilities and construction sites that don't carefully handle waste can introduce trash into the watershed.

- Another problem in some urban areas is older sewer systems (i.e. combined-sewer overflow systems). Heavy rains can produce too much water for sewer systems to handle and, as a result, sewage containing trash (e.g., cotton swabs, tissues, toilet paper) is released into waterways.

Ocean-based sources: Boats and ships, oil drilling rigs, fish farms, and other structures at sea can be sources of marine debris. Garbage can be dumped, accidentally blown, or washed overboard. Common ocean-based items include food waste and wrappers, fishing nets and gear, and shipping cargo. Wrecked or abandoned boats, buoys, and other equipment also create marine debris.

#### The Harmful Effects of Marine Debris

Trash and marine debris in our lakes, rivers, and oceans has a direct impact on our lives.

Broken glass, medical waste, and other harmful discarded items can injure people or make them sick. Trash can contain bacteria or chemicals that pollute the water. And when someone litters, it means someone else has to clean it up. For local governments, that can mean spending millions of dollars every year just to clean up litter and trash.

Ugly and dirty waters filled with marine debris can hurt a local community. When a lake, river, or ocean is polluted or filled with trash, no one wants to go there. The community loses the opportunity to give its residents a great place to have fun, and also loses the opportunity to help businesses and create jobs. On the other hand, attractive waterfronts are places residents and tourists like to visit. New businesses can open to rent boats or bikes, or sell things like hot dogs and ice cream, which in turn creates jobs.

Wildlife is also harmed by marine debris. Small animals can be cut by jagged cans or trapped in containers. Sea birds, sea turtles, fish, and other marine animals often become entangled in marine debris, causing injury or death. Additionally, marine animals often eat marine debris that they mistake for food. Eating the marine debris can lead to starvation or malnutrition when the marine debris collects in the animal's stomach causing the animal to feel full.

#### What Can be Done to Prevent Marine Debris?

Marine debris is a problem created by people. It is also a problem people can solve. Here are some things you can do to help:

1. *Get bugged by litter.* Set an example for those around you by always putting trash in a proper receptacle.

## Classroom Activity 1

### Lesson: Litter and Debris in Our Urban Waterways

2. *Put a lid on trash.* Place trash in covered garbage bins to keep debris from blowing or washing away.
3. *Reduce, reuse, and recycle.* Trash is becoming a bigger problem in our waterways and oceans in part because there is simply more of it. Reducing the amount of trash that goes into garbage cans, garbage trucks, and landfills helps reduce the amount of waste that is accidentally blown or washed into the environment.
4. *Volunteer for a cleanup.* Organize a cleanup of a waterway in your hometown. Or sign up for the Ocean Conservancy's annual International Coastal Cleanup (ICC). The ICC is held every September in both inland and coastal areas. To sign up for a cleanup, visit [www.coastalcleanup.org](http://www.coastalcleanup.org).

## **Classroom Activity 1**

### **Quiz: Litter and Debris in Our Urban Waterways**

- 1. What is marine debris?**
- 2. What is a major cause of marine debris?**
- 3. Name five to ten common types of marine debris.**
- 4. What is a watershed?**
- 5. Explain how trash can travel from a city street to the ocean.**





## Classroom Activity 1

### Quiz Answers: Litter and Debris in Our Urban Waterways

1. Marine Debris is trash that enters our streams, rivers, and oceans.
2. Littering is a major cause of marine debris.
3. Any of the following are correct: cigarettes and cigarette filters, plastic beverage bottles, plastic bags, caps and lids, food wrappers and containers, cups, plates, forks, knives, spoons, glass beverage bottles, straws/stirrers, beverage cans, paper bags.
4. A watershed is a system of interconnected waters, including streams or wetlands, which empty into rivers, eventually running to the sea.
5. A piece of litter dropped on a city street can be blown by wind or washed by rain into a nearby waterway, and begin its journey to the sea (or some variation of this concept).
6. Most marine debris starts out on land.
7. Any of the following are correct: Littering; mishandled or mismanaged trash; industrial facilities or construction sites; older sewer systems (or combined sewer overflow systems).
8. Any of the following are correct: Boats and ships, oil drilling rigs, fish farms, other structures at sea.
9. Any of the following are correct: Injury to people; expense to local governments; harm to appeal, beauty or aesthetics of local community; harm or death of wildlife.
10. Things you can do to stop marine debris: (1) *Get bugged by litter* - Put trash in a proper receptacle; (2) *Put a lid on trash* - Place trash in covered garbage bins to keep debris from blowing or washing away; (3) *Reduce, reuse, and recycle* - Reduce the amount of trash that goes into garbage cans, garbage trucks, and landfills; and (4) *Volunteer for a cleanup* - Organize a cleanup of a waterway in your hometown or sign up for the Ocean Conservancy's annual International Coastal Cleanup.

## Classroom Activity 2

### All Tangled Up



**Grades:** 4-7



**Time:** 10 minutes to play; 30 minutes to write paragraph.



**Objective:** Students will learn about wildlife entanglement by experiencing what it might be like to be a marine animal trapped in a piece of trash that was thrown onto a city street and travelled by water or wind to the ocean.



**Materials:**

- Small- to medium-sized thin rubber band or strip of masking tape for each student.



**Procedure:** Distribute the rubber bands or tape to students and have them follow the procedure below. (Note: You may want to have one or two students come up to the front of the room to demonstrate how to use the rubber bands/tape).

- Hold your hands in front of your face, with the back of your hands toward your face.
- Hold the rubber band in your right hand and hook one end over the little finger of your left hand.
- Hook the other end of the rubber band over your left thumb. The rubber band should be taut and resting across the bottom knuckles on the back of your left hand.
- If using tape, have another student tape around the little finger, across the back of the hand and around the thumb.
- Place your right hand on the bottom of your left elbow, and keep it there.
- Try to free your hand of the rubber band or tape without using your right hand, teeth, face, or other body parts.

While students struggle to remove the rubber bands/tape, ask the class to imagine that they are seagulls that have a plastic six-pack ring or discarded fishing line caught on their beaks or necks. Tell them that the birds will be unable to eat until they free themselves. Ask them the following types of questions:

- How would you feel after struggling like this all morning?
- What would happen if you continued to miss meals and spent all of your strength fighting to get free?
- What would happen if a predator were chasing you?

## Classroom Activity 2

### All Tangled Up

- How does trash travel from our streets to the oceans?
- How can we prevent animals from getting entangled in or accidentally eating marine debris?

After the rubber band/tape activity has been completed, ask the students to write a paragraph on either of the following two topics:

- Choose one animal (e.g., sea turtle, seal, fish, seagull, or other bird) and write a paragraph from that animal's point of view telling how it feels to be entangled in marine debris.
- Describe how trash travels from our streets to our waterways and beaches and how this can be prevented.

## Classroom Activity 3

### Marine Debris Timeline



**Grades:** 4-7



**Time:** 20 minutes



**Objective:** Students will learn about litter and marine debris, and how it can persist in the environment.



**Materials:**

- Approximately 12 feet of rope, string, or a whiteboard
- 10 marine debris time tags (listed below)
- 10 common street litter items (or pictures of items) which can become marine debris (listed below)



**Procedure:** Use a length of rope or draw a line on a whiteboard to represent 600 years of decomposition time. Write the ten “time tags” on pieces of paper and attach them to the rope, or draw them on the whiteboard.

Divide students into 10 teams. Give each team one litter item or picture. Have the teams discuss how long they think their item will take to fully decompose. Then ask the teams to place their item next to the appropriate time tag.

After all the teams have placed their litter item, read out the correct decomposition times one at a time. If teams have placed an item incorrectly, have the students move the item to the correct time tag. Discuss the decomposition factors of each litter object, and ask students how each litter item can become marine debris.

Time tag	Litter item / marine debris
2 to 4 weeks	Paper towel
6 weeks	Newspaper
2 months	Cardboard box
1 to 5 years	Cigarette filter
1 to 20 years	Plastic grocery bag
50 years	Plastic foam cup
80 to 200 years	Aluminum can
450 years	Plastic beverage bottle
450 years	Disposable diaper
>600 years	Glass bottle

## Take Home Activity

### Trash and Recycling Log



**Grades:** 4-7



**Time:** 15 minutes to explain activity; 15 minutes per day for students to log discarded items; 1 hour for students to write summary of items.



**Objective:** Students will understand how their habits and activities may contribute to the marine debris problem. Students will also learn how proper waste disposal methods and recycling can help prevent trash and litter from becoming marine debris.



**Materials:**

- Trash and Recycling Log handout



**Procedure:** On a Friday afternoon, pass out copies of the Waste Inventory Log handout. Discuss the Waste Inventory Log with the students and explain that from Monday through Friday of the next week they will write down everything they throw away or recycle at home and at school. In the “Item” column, they should list every item they throw away or recycle. In the “How Many?” column they should put a mark every time they throw away or recycle that type of item. Before they begin recording their discarded items, ask students to write down a prediction of how many items they think they will throw away or recycle over the next week. At the end of the week, the students should add up the total number of items they discarded in the trash and recycled throughout the week. After reviewing the items, ask students to:

1. Write a short summary of the types of items they discarded, noting those that were, or could have been recycled.
2. Discuss if the number of items they discarded was more or less than they predicted.
3. Describe how their waste items could be contributing to the marine debris problem, and ways they could prevent this from occurring.

Teachers can reinforce the lesson by using a waste log in the classroom and counting the trash produced by class. This is also an opportunity to discuss ways to reduce, reuse, and recycle to decrease the amount of waste each of produces.







## Field Trip Activity

### Clean Sweep Cleanup



**Grades 4-7 -**



**Time:** 1 hour for cleanup event planning; 3 hours for cleanup event; 30 minutes for follow-up (10 minutes for discussion, 20 minutes for writing the summary).



**Objective:** Students will experience how trash and litter can affect community waterways and discover that by taking action, people can make a difference.



**Materials:**

- Kitchen-sized garbage bags
- Latex or garden gloves
- Cleanup Card handout



**Safety Note:** Some items that may be collected could be hazardous if handled improperly. Students should always wear safety gloves when collecting debris. Students should not handle sharp objects or items they do not recognize. Adult supervision is strongly recommended.



**Procedure:**

*Planning:* Ask students to help select a nearby stream, river, lake, beach, or other waterway to clean up. Ask students whether they think the site will have a lot of trash. Set a date and time when the class can meet at the site; arrange transportation and permission slips if needed. Ask students to encourage other people to participate in the cleanup.

*Note:* You should check with your local municipality in advance to find out where to place collected bags or how to arrange a trash pick-up after the event.

*Cleanup Day:* Once at the site, each person should find a partner to pair up with. One person will be the trash collector and the other will be the recorder. The recorder should carry the trash bag (a bag for recyclables can also be carried) and a Cleanup Card. As the collector picks up the trash, both should try to identify the item before the collector places it in the trash or recyclables bag. The recorder then writes the information on the Cleanup Card. Objects too large to be collected (i.e., cars, tires, etc.) should still be noted and identified on the Cleanup Card.

At the end of the cleanup, each pair should total the amount of debris found for each category listed on the Cleanup Card, as well the total number of items found. All Cleanup Cards should be returned to the teacher/cleanup organizer. Additionally, the students should ensure all the debris collected is properly disposed of or recycled.

## Field Trip Activity

### Clean Sweep Cleanup

*Follow up:* After the cleanup, add up the numbers from all the Cleanup Cards, calculating the totals for each category as well as for the entire cleanup (this can be a student activity if desired). Discuss the totals with the class. Ask students if they found more or less trash than they expected and whether they noticed any trends. These trends could include:

- Did certain types of items make up a big part of the debris? Where might these items have come from (storm drains, littering, industrial facilities)?
- What were some of the most unusual types of debris found? Where might these items have come from?
- Which types of debris could pose problems to area wildlife? How?
- Will beach cleanups solve the marine debris problem? Why or why not?
- What are some steps we can take to prevent marine debris in the first place?

Ask students to also discuss how lifestyles in the community may have contributed to the collected debris. Questions they could address include:

- Is the waterway near an area with a large population?
- Does the area near the waterway have recycling programs?
- Do these items seem to be things that residents use every day?

End the activity by having students write a brief summary of the cleanup that addresses the topics covered in the follow-up discussion.

## Field Trip Activity

### Clean Sweep Cleanup Card

Item Found (from Land-Based Activities)	Number	Total
Appliances		
Bags (paper)		
Bags (plastic)		
Balloons		
Batteries		
Beverage Bottles (plastic)		
Beverage Bottles (glass)		
Beverage Cans		
Building Materials		
Caps, Lids		
Cars/Car Parts		
Cigarettes/Cigarette Filters		
Cigarette Lighters		
Cigar Tips		
Clothing, Shoes		
Cups, Plates, Forks, Knives, Spoons		
Food Wrappers/Containers		
Pull Tabs		
6-Pack Rings		
Straws, Stirrers		
Tires		
Tobacco Packaging/Wrappers		
Toys		
Other/Miscellaneous (Fill-in Below)		
-		
-		
-		
<b>Total Items (from Land-Based Activities)</b>		

<b>Item Found (from Water-Based Activities)</b>	<b>Number</b>	<b>Total</b>
Bait Containers/Packaging		
Bleach/Cleaner Bottles		
Buoys/Floats		
Fishing Line		
Fishing Lures		
Oil/Lube Bottles		
Rope		
Other/Miscellaneous (Fill-in Below)		
-		
-		
-		
<b>Total Items (from Water-Based Activities)</b>		
<b>TOTAL OF ALL DEBRIS ITEMS</b>		

## Unit Review

### Marine Debris: The Urban-Coastal Connection

#### QUESTIONS

1. Name an action that is a major cause of marine debris.
2. TRUE or FALSE: The most common types of marine debris are disposable items people use every day.
3. What are the two major sources of marine debris? Give an example of each type.
4. Which of the following is NOT a harmful effect caused by marine debris:
  - a. It can make people sick or cause injury.
  - b. It can make beaches more attractive places to visit.
  - c. It costs a lot of money to clean up.
  - d. It can harm or endanger wildlife.
5. TRUE or FALSE: Rural areas tend to produce more marine debris than urban areas.
6. Name one thing you can do to prevent marine debris.

## Unit Review

### Marine Debris: The Urban-Coastal Connection

#### SHORT ESSAY

7. In the “All Tangled Up” activity, you got a sense of how wildlife can be affected by marine debris. What will you do, or do differently, to prevent marine animals from being harmed by marine debris?
  
  
  
  
  
  
  
  
  
  
8. In the “Marine Debris Timeline” Activity, you learned how long it took certain common litter items to decompose. Were you surprised by how long it took? Does this make you think twice about throwing trash on the ground?
  
  
  
  
  
  
  
  
  
  
9. After completing the “Waste Inventory” take home activity, was the amount of trash you discarded in a week more or less than you expected? What are some ways you can decrease the amount of waste/trash you produce?
  
  
  
  
  
  
  
  
  
  
10. In the “Clean Sweep Cleanup” activity, you participated in a cleanup field trip. Was there more or less trash than you expected? Did seeing all the trash and the work it took to clean it up make you think differently about your own habits? Why or why not?

## Marine Debris: The Urban-Coastal Connection

### Unit Review Answers

1. Littering is a major cause of marine debris.
2. True
3. Land-Based & Water-Based Sources;  
Examples of land-based sources: Small towns, big cities, rural areas, and urban areas, are all considered land-based sources of marine debris.  
Examples of Water-based sources: Boats and ships, oil drilling rigs, fish farms, and other structures at sea.
4. b.
5. FALSE
6. *Any of the following are correct:* Put trash in a proper receptacle; place trash in covered garbage bins to keep debris from blowing or washing away; reduce the amount of trash that goes into garbage cans garbage trucks, and landfills; organize a cleanup of a waterway in your hometown; or sign up for the Ocean Conservancy's annual International Coastal Cleanup.

*Note: For Questions 7-10, there is not one "right answer". Teachers should use their discretion on what is correct based on a student's answer.*